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Abstract

Industrial exoskeleton evaluation in controlled and in-situ environment: Preliminary results

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Abstract:

SDespite industrial (r) evolutions, workers are still exposed to factors that increase their risk of musculoskeletal disorders. Exoskeletons aim to support the worker and reduce musculoskeletal stress. While multiple industrial exoskeletons reached the market and multiple exoskeletons have been tested in laboratory conditions, in-sit comparisons of exoskeletons is lacking. In this study two industrial exoskeletons were evaluated; the Laevo and the BackX, both supporting the lower back and hip. Twelve workers completed a test in which the physical work was evaluated without exoskeleton. Subsequently, the test was repeated with two different exoskeleton devices. Each test consisted of two parts; a part with isolated movements (e.g. squat), and a part in which the normal working routine was executed. During each trial heart rate was recorded, together with electromyographic (EMG) data of the right lumbar erector spinae, quadriceps vastus medialis, biceps femoris and trapezius descendens. Session rate of perceived exertion (sRPE) scores were gathered after each set of isolated movements and after the in-situ testing. Furthermore, questionnaires regarding the device's usability, workload and heat were gathered. The non-parametric Friedman tests compared the different trials. Currently, the data of 7 out of 12 subjects was processed. No differences were found in heart rates, nor activity of the erector spinae. Session rate of perceived exertion data revealed a trend to a reduced perceived exertion during squatting with one exoskeleton ($p = 0.073$). During movements in which the hip joint was more stationary, sRPE scores were higher when wearing an exoskeleton ($p = 0.007$). Exoskeletons reduce the perceived exertion while performing the specific movements it was designed for.

A higher effort was perceived while wearing the exoskeletons during overhead working.

Biography:

Sander De Bock is in the second year of his PhD and is 25 years old. He graduated as a movement scientist, specialized in sport-related research. His research now focusses on exoskeleton evaluation, in which he is both evaluating prototypes and commercially available exoskeletons. He has a wide range of interests, going from ergonomics, to motor control, machine learning and brain-machine interfaces.

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